Supplementary Information

Direct Large-Area Growth of Graphene on Silicon for Ultra-Low-Friction and Silicon-Based Technologies

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Figure S1

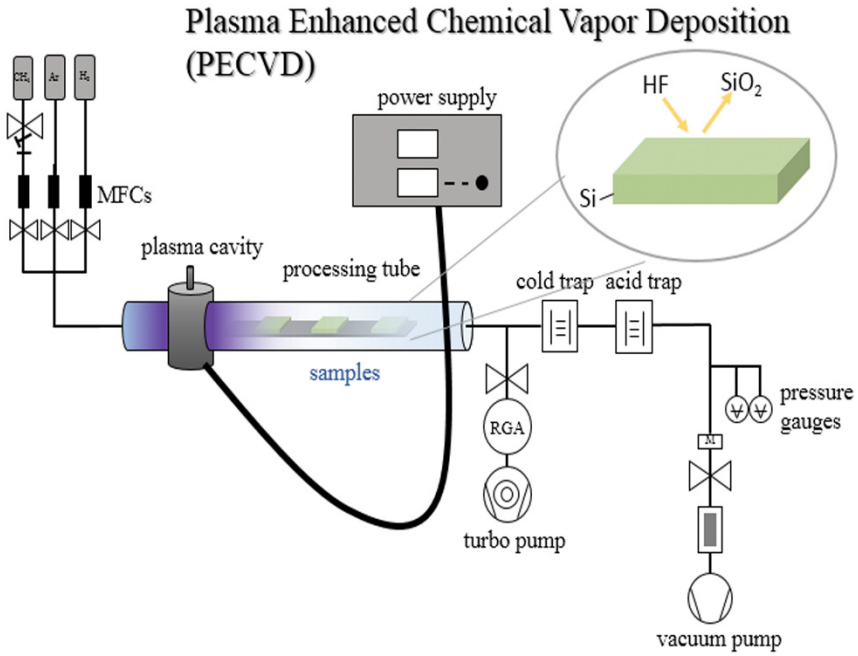

Figure S1: The PECVD setup for direct graphene growth on silicon, which includes the plasma generator, growth-tube, vacuum pumps, mass-flow-control (MFC) valves, and different gases for the growth. HF was used to remove native SiO_2 on the surface of Si substrates immediately before the substrates were inserted into the growth chamber. More details about our PECVD setup can be found in References 48 and 49.

Figure S2.

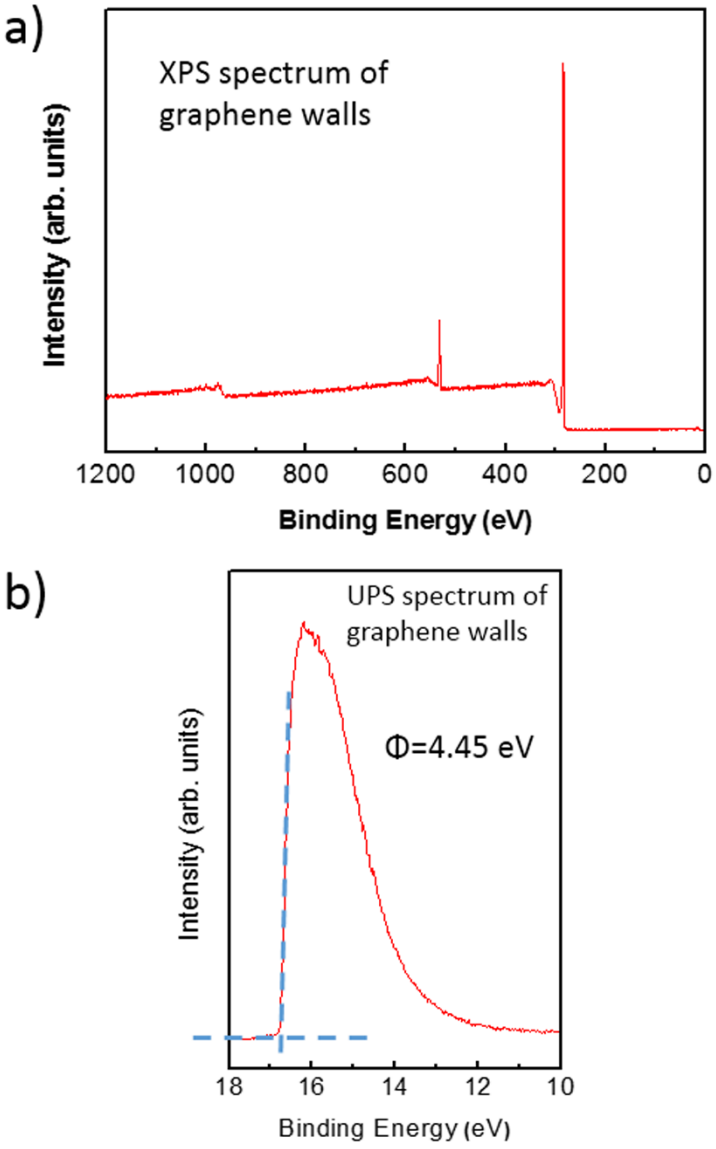

Figure S2: (a) XPS and (b) UPS spectra of graphene nano-walls on Si substrates. These results were very similar to those obtained from horizontal graphene sheets on Si substrates.

Figure S3.

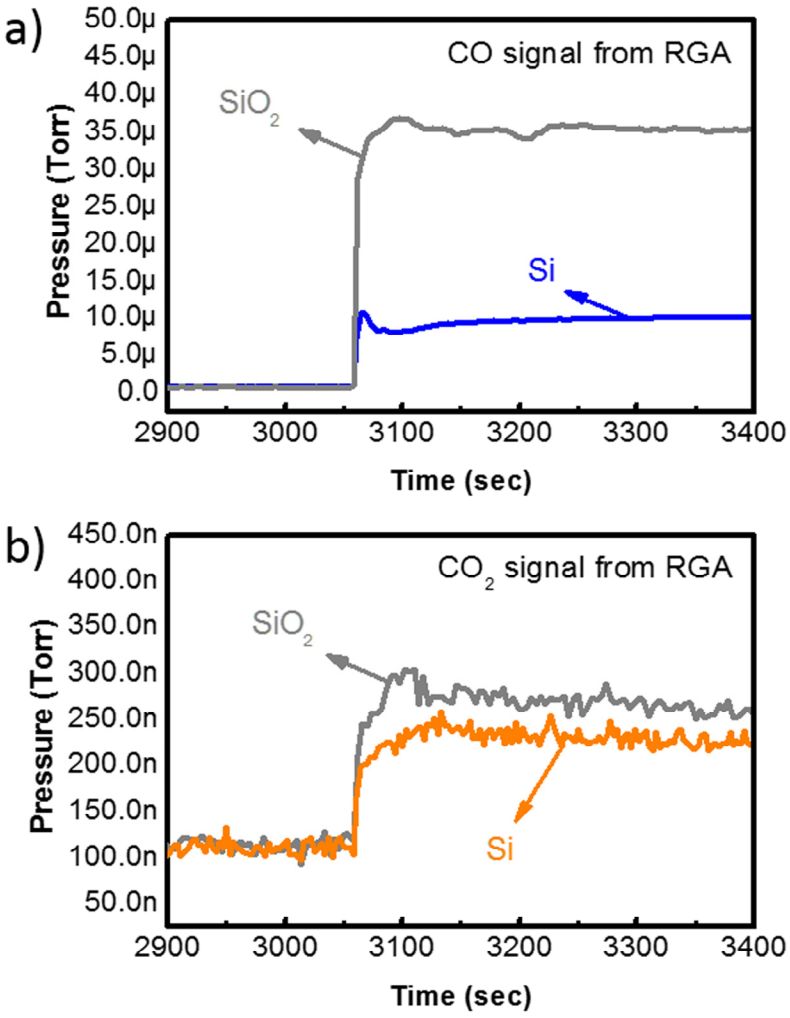

Figure S3: Comparison of the RGA records of (a) CO and (b) CO_2 signals taken during the PECVD growth of graphene on Si and SiO_2 substrates, respectively. Here the sharp rise of CO and CO_2 signals corresponded to the time when plasma was ignited.

Figure S4.

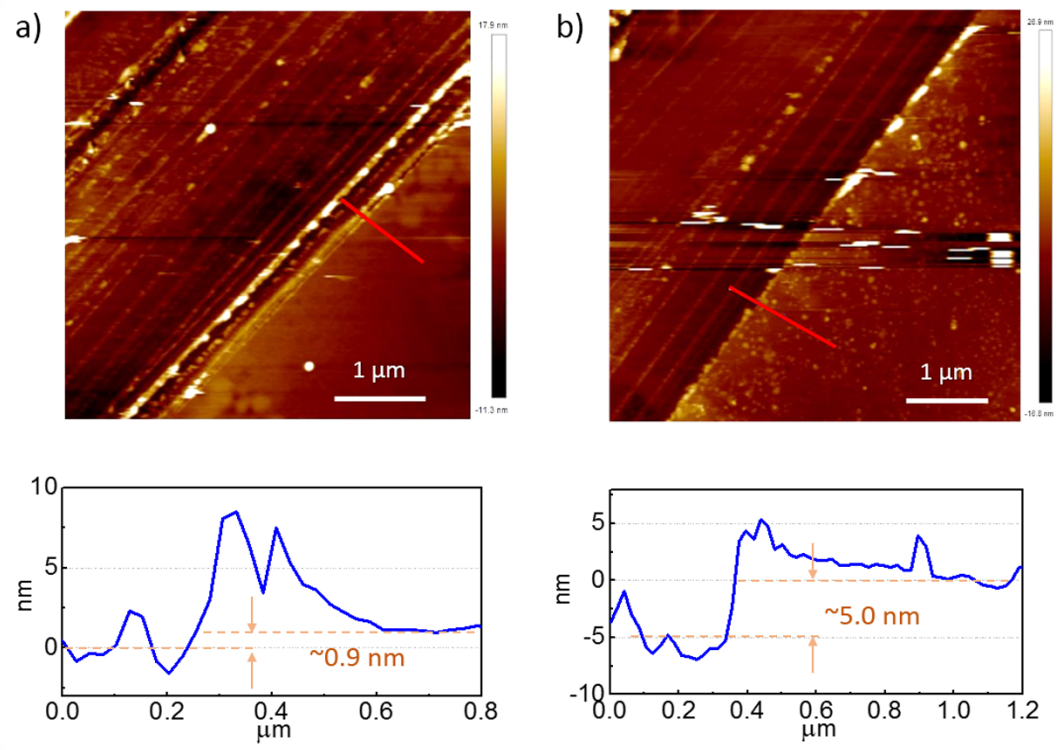

Figure S4: AFM studies of the cross-sectional profiles of (a) 3 and (b) 14 layers of graphene sheets grown on Si substrates. A sharp AFM tip was used to make scratches on graphene surfaces for cross-sectional studies. Some overshoots were formed due to the method used to create scratches, and so the steps were determined by the mean heights at distances far from the cuts.